REMARKS

Summary of the Office Action

Claims 1-45 are currently pending in this application.

The Examiner has rejected claims 1-45 under 35 U.S.C. § 103(a) as allegedly being obvious from Beard U.S. Patent No. 7,302,316 ("Beard").

Applicant's Reply

Applicant has amended claims 1-4, 23, 25, 38, and 44 to more particularly define the invention. Applicant has amended claims 15-17, 22, 27, 33, 39, and 45 to correct various informalities and typographical errors. No new matter has been added, and the amendments of the claims are fully supported by the originally filed application.

Claims 1-45 have been rejected under 35 U.S.C. § 103(a) as allegedly being obvious from Beard. These rejections are respectfully traversed.

Claims 1 and 44

Applicant's claimed invention, as defined by amended independent claims 1 and 44, is directed to a method (claim 1) or system (claim 44) for controlling an unmanned vehicle ("UV") with a state machine on the UV. A state of the state machine is entered, and an input on the UV is received. A condition of a rule corresponding to the state using the input is evaluated, and at least one action corresponding to the rule is performed based on a result of the evaluating. The state machine is reconfigured as a new state machine.

For example, applicant's FIG. 7 illustrates the reconfiguration of state machine 700 to state machine 750 (see applicant's specification at page 17, ll. 19-21). In this

illustrative example, phases and transitions of state machine 700 can be modified by a rule of the state machine (see applicant's specification at page 16, ll. 30-33). Thus, applicant's invention can advantageously support dynamic reconfiguration of a UV's state machine as a new state machine in response to conditions detected during operation of the UV.

Beard does not show or render obvious at least reconfiguring a state machine as a new state machine, as required by applicant's amended claims 1 and 44. The Examiner contends that "although Beard does not use the term 'state machine' it would have been obvious to one of ordinary skill in the art to utilize the Kalman filter of Beard to process the state variables in order to obtain new state information," (Office Action, page 3). Applicant respectfully disagrees.

According to Beard, state variables are sampled by sensors and then processed through a fixed gain Kalman filter, "whereupon new state variable estimates are calculated," (Beard, col. 3, ll. 12-22). Applicant respectfully submits that processing state variables in order to obtain new state information is not the same as reconfiguring a state machine as a new state machine. Applicant's claims require that a state machine be reconfigured as a new state machine. There is no disclosure in Beard at all for reconfiguring a state machine as a new state machine. For example, if a given set of inputs is re-presented, Beard's filter will output the same "new" variables. Applicant's reconfigured state machine, on the other hand, may respond differently to the re-presentation of the same inputs because the state machine reacting to those inputs will be different.

For at least these reasons, applicant respectfully submits that amended independent claims 1 and 44, and by extension dependent claims 2-14, are patentable over Beard.

Claims 15 and 45

Applicant's claimed invention, as defined by amended independent claims 15 and 45, is directed to a method (claim 15) or system (claim 45) for managing a first participant in a network of unmanned vehicles and ground stations, wherein said network includes at least one other participant. First state information about the first participant is maintained. An update of the first state information is transmitted to the at least one other participant. Second state information is maintained about the at least one other participant, and an update of the second state information is received from the at least one other participant.

For example, as discussed in applicant's specification in connection with FIG. 4, applicant's invention can advantageously maintain reflections of the virtual pilot of each network participant on other participants in the network, thereby permitting "more informed and efficient communication between the [virtual pilots], as well as providing redundancy for backup purposes," (applicant's specification, page 10, ll. 15-25).

Beard does not show or render obvious transmitting an update of first state information from a first participant to at least one other participant. The Examiner concedes that Beard does not disclose the participation of other unmanned aerial vehicles (UAVs). However, the Examiner contends that "it would have been obvious to one of ordinary skill in the art to control one or any number of other unmanned vehicles since this would have been a matter of scalability," (Office Action, page 4). Applicant respectfully disagrees.

First, the Examiner has not established any reason why one of skill in the art would modify Beard in the manner

suggested by the Examiner. As the Supreme Court has recognized, "[i]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," (KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385, 1396 (S.Ct. 2007)) and the Examiner has identified no such reason.

Second, Beard is directed to autonomous UAV flight using communication with a ground station. The ground station monitors the UAV and sends command instructions to the UAV (see Beard, col. 5, ll. 48-51). It is not simply a matter of scalability to modify the system of Beard in an attempt to arrive at applicant's claimed invention. Applicant's claims require transmitting an update of first state information from a first participant to at least one other participant. Beard discloses that a UAV is only in communication with a ground station. The ground station "processes desired command instructions to be sent to the UAV," and "monitor[s] the status of the UAV," (Beard, col. 5, ll. 48-51). There is no disclosure, at all, of any communication between multiple UAVs, at least because Beard does not disclose multiple UAVs. Even if one of skill in the art would modify Beard as suggested by the Examiner, all that would result would be a system in which multiple UAVs communicate in individual sessions with a ground station.

For at least these reasons, applicant respectfully submits that amended independent claims 15 and 45, and by extension dependent claims 16-22, are patentable over Beard.

Claim 23

Applicant's claimed invention, as defined by amended independent claim 23, is directed to a system for controlling

an unmanned vehicle with a state machine on the UV. A sensor is mounted on the UV, and a controller module is mounted on the UV and coupled to the sensor. A junction is mounted on the UV coupled to the sensor and the controller module. A command unit is mounted on the UV and coupled to the junction, where the command unit is configured to control the UV using the controller module based on information from the sensor, and the junction is configured to facilitate communication between the sensor, the controller module, and the command unit.

Applicant's claim 23 defines a junction that is coupled to, and configured to facilitate communication between, a sensor, a controller module, and a command unit on the UV (see, e.g., junction 106 of FIG. 1). The use of a single junction as a common point of communication can advantageously provide a number of benefits. For example, as discussed in applicant's specification in connection with FIG. 8, junction 806 can be used to provide backup measures to handle the failure of virtual pilot 803. The backup measures can include using junction 806 to facilitate communication between remaining modules 802 and 807, while taking advantage of information from gound stations and other UVs 850 (see applicant's specification at page 20, ll. 15-28).

Beard does not show or render obvious a central junction used to facilitate communication between a sensor, a controller module, and a command unit. Rather, Beard shows a processor coupled to various sensors and memory (see Beard, FIG. 2 and col. 6, ll. 23-26). As such, if the processor of Beard were to fail or otherwise malfunction, there would be no backup structures that would permit communication between the sensor, the processor, and external logic (if appropriate) that could assist in controlling the vehicle in such a situation. The Examiner contends that the "on-plane control system" is a

junction (Office Action, page 4). However, the on-plane control system is not configured to facilitate communication between a sensor, a control module, and a command unit. Rather, the on-plane control system is "a number of different sensors in electronic communication with the processor," (Beard, col. 2, ll. 47-49).

For at least these reasons, applicant respectfully submits that amended independent claim 23, and by extension dependent claims 24-32, are patentable over Beard.

Moreover, dependent claim 25, which depends indirectly from claim 23, is patentable for at least an additional reason. Dependent claim 25 specifies that the command unit is configured to execute a state machine that is responsive to information from the sensor, and that the state machine can reconfigure itself as a new state machine responsive to information from the sensor. As discussed above in connection with claims 1 and 44, Beard does not show or render obvious this feature of applicant's claims. Thus, for at least this additional reason, applicant respectfully submits that dependent claim 25 is patentable over Beard.

Claim 33

The Examiner discussed the rejection of claim 33 along with the rejection of claims 15 and 45 on page 3 of the Office Action. However, claim 33 does not have the same limitations as claims 15 and 45 and thus the limitations of claim 33 were not addressed in the Office Action.

Applicant's claimed invention, as defined by amended independent claim 33, is directed to a method of communicating between a first sender and a recipient. A probability that a second communication from a second sender will interfere with a first communication from a first sender to the recipient is

determined. A quantity derived from the probability is compared to a threshold, and the first sender and the recipient communicate in the channel based on a comparison of the derived quantity to the threshold. Thus, applicant's invention can advantageously provide a probabilistic communication scheme that is based at least partly on the likelihood of interference from a third-party sender. For example, one of the results of such a system is that the first sender can use communication resources normally allocated to the second sender if the probabilities indicate that interference from the second sender is unlikely.

In contrast, Beard simply refers to a transmitter/receiver on the UAV that sends and receives data to a ground station whenever the appropriate processing is needed. These transmissions do not depend on a probability that a communication from another sender will interfere with a communication from the first sender, and do not require comparing a quantity derived from that probability to a threshold in order to affect communication between the first sender and the recipient. This is consistent with Beard's disclosure, which does not disclose multiple UAVs. Accordingly, it would not be obvious for one of skill in the art to modify Beard to arrive at the invention claimed by applicant.

For at least these reasons, applicant respectfully submits that amended independent claim 33, and by extension dependent claims 34-43, are patentable over Beard.

Conclusion

For the reasons stated above, applicant respectfully submits that this application, as amended, is in condition for

allowance. Reconsideration and prompt allowance of this application are accordingly respectfully requested.

Respectfully submitted,

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